CLAIMS

1. A material for slush molding, comprising:

a thermoplastic polyurethane resin (A); the difference between the softening starting temperature and the softening ending temperature of said resin (A), by the thermomechanical analysis penetration mode, being from 0 to 30°C, and the softening starting temperature of said resin (A) being from 135 to 200°C.

2. The material for molding according to claim 1, in which said resin (A) comprises

a polyurethane resin having a hard segment (A1) with a number average molecular weight of 200 to 2000 comprising at least one species selected from the group consisting of a diisocyanate (a1) having a symmetrical structure, a low molecular-weight diamine (a2) having a symmetrical structure, and a low molecular-weight diol (a3); and

a soft segment (A2) having a high molecular-weight diol (a4) with a number average molecular weight of 500 to 5000,

with the content of hard segment in the resin (A) being from 5 to 50% by weight, the content of aromatic rings in the resin

(A) being 35% by weight or less, and the content of aromatic rings and the content of urea groups satisfying the following relation (i):

$$-0.1x + 2.5 \leq y \leq -0.1x + 6 \qquad (i)$$

wherein x represents the content (% by weight) of aromatic rings in the resin (A), and y the content (% by weight) of urea groups in the resin (A).

3. The material for molding according to claim 2, in which

the content x of aromatic rings in the resin (A) is from 5 to 25% by weight, and in which

the content of aromatic rings and the content y of urea groups satisfy the following relation (i'):

$$-0.1x + 3 \leq y \leq -0.1x + 5 \qquad (i')$$

4. The material for molding according to claim 2 or 3, in which

said hard segment (A1) is a hard segment having a number average molecular weight of 200 to 2000 and comprising at least one species selected from the group consisting of a diisocyanate (a1) having a symmetrical structure, a low molecular-weight diamine (a2) having a symmetrical structure, and a low molecular-weight diol (a3') having a symmetrical structure.

5. The material for molding according to any one of claims 2 to 4, in which

said diamine (a2) is at least one species selected from the group consisting of straight chain alkylenediamines having a carbon number of 2 to 18, bis(2-aminoethyl) carbonate, 4,4'-dicyclohexylmethanediamine, cyclohexane-1,4-diamine, p-xylylenediamine, α,α,α',α'-tetramethylxylylenediamine, and 4,4'-diamino-diphenylmethane.

6. The material for molding according to any one of claims 2 to 5, in which

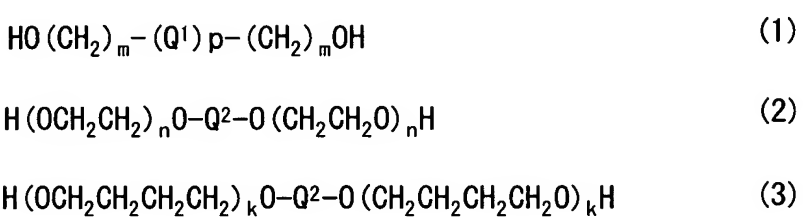
said diisocyanate (a1) is at least one species selected from the group consisting of 1,2-ethylenediisocyanate, 1,4-tetramethylenediisocyanate, 1,6-hexamethylenediisocyanate, 1,12-dodecamethylenediisocyanate, bis(2-isocyanatoethyl) carbonate, 4,4'-dicyclohexylmethanediisocyanate, cyclohexane-1,4-diisocyanate, p-xylylenediisocyanate, α,α,α',α'-tetramethylxylylenediisocyanate, and 4,4'-diphenylmethanediisocyanate.

7. The material for molding according to any one of claims 2 to 6, in which

a residue of said diamine (a2) has the same structure as a residue of said diisocyanate (a1).

8. The material for molding according to any one of claims 2 to 7, in which

said diol (a3) is indicated by any one of the general formulas (1), (2), and (3) below:



$$HO(CH_2)_m-(Q^1)p-(CH_2)_mOH \quad (1)$$

$$H(OCH_2CH_2)_nO-Q^2-O(CH_2CH_2O)_nH \quad (2)$$

$$H(OCH_2CH_2CH_2CH_2)_kO-Q^2-O(CH_2CH_2CH_2CH_2O)_kH \quad (3)$$

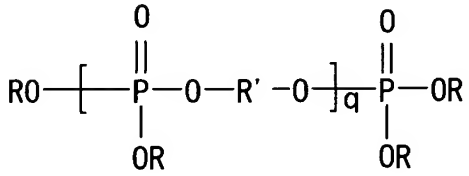
wherein in the formula (1), Q^1 is a methylene group, 1,4-cyclohexylene group or 1,4-phenylene group, p is 0 or 1, and m is 0 or an integer of 1 to 6 provided that when p is 0 or Q^1 is a 1,4-phenylene group, then m is from 1 to 6, in the formulas (2) and (3), Q^2 is a residue of bisphenols or 1,4-phenylene group, n is an integer of 1 to 3, and in the formula (3), k is 1 or 2, and when Q^2 is a residue of bisphenols, then k is 1.

9. The material for molding according to any one of claims 1 to 8, in which

the material comprises said resin (A) and plasticizer (B); the material being a powder with a volume average particle diameter of 100 to 500 μm, and the content of powder particles having a particle diameter of 75 μm or less being 20% by weight or less.

10. The material for molding according to claim 9, in which

said plasticizer (B) is a phosphoric acid ester indicated by the following general formula (5):



(5)

wherein R is a monovalent hydrocarbon group having a carbon number of 1 to 10, which may be substituted with a halogen, a plurality of Rs may be the same or different, R' is a divalent organic group having a carbon number of 2 to 15, which may be substituted with a halogen, and q is an integer of 1 to 6.

11. The material for molding according to claim 10, in which

R in the general formula (5) is a phenyl group, an alkylphenyl group, or a halogen-substituted phenyl group, and R'is a group indicated by the following general formula (6):

-Ph'-(A-Ph')p- (6)

wherein Ph' is 1,4-phenylene group, p is 0 or 1, A is a direct bonding, a methylene group, an isopropylidene group, or SO.

12. The material for molding according to claim 9, in

which

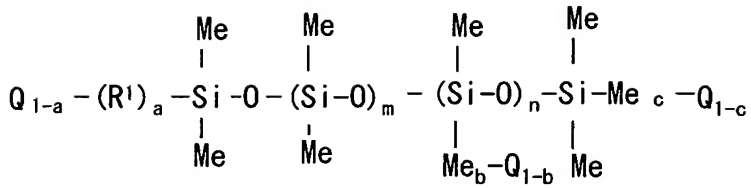
said plasticizer (B) is an aromatic monocarboxylic acid diester of a polyalkylene glycol.

13. The material for molding according to any one of claims 1 to 12, further comprising:

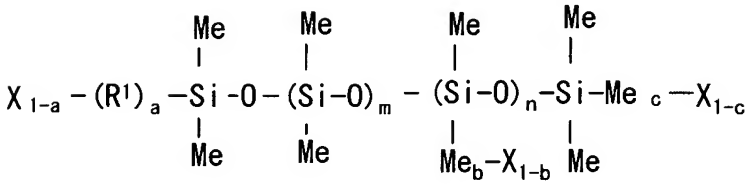
an internal release agent for a slush molding polyurethane surface molding material (C) comprising

at least one species selected from the group consisting of fluorine-modified phosphates (salts) (f) indicated by the general formula (11) and modified silicones containing a polar group (c):

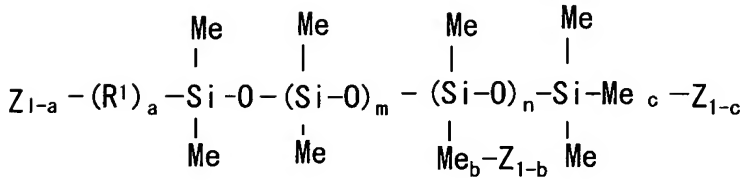
the modified silicones containing a polar group (c) being at least one species selected from the group consisting of carboxyl-modified organopolysiloxanes (c1) indicated by the general formula (8), epoxy-modified organopolysiloxanes (c2) indicated by the general formula (9), and ether-modified organopolysiloxanes (c3) indicated by the general formula (10);



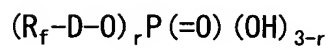
(8)



(9)

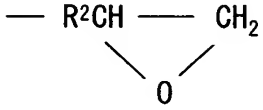


(10)

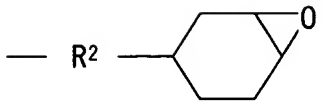


(11)

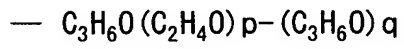
wherein in the formulas (8) to (10), Q is a carboxyl group indicated by $-R^2COOH$, X is an epoxy group indicated by



or



Z is a polyether group indicated by



;

R^1 is an alkyl group having a carbon number of 1 to 4, R^2 is an alkylene group having a carbon number of 1 to 4, R^3 is H, an alkyl group having a carbon number of 1 to 4, or an acetyl group, and Me is a methyl group; a, b, and c each are 0 or 1, respectively, and when a = 1,and b = 1, then c = 0; m and n are numbers that satisfy the conditions that (m + n) is from 10 to 200, and n/(m + n) is from 0 to 0.5; p and q are numbers that satisfy the conditions that (p + q) is from 3 to 100, and p/(p + q) is from 0 to 0.6; in the formula (11), Rf is a perfluoroalkyl group having a carbon number of 4 to 20; D is a divalent organic group indicated by $-CH_2CH(E)C_sH_{2s}-$ or $-SO_2N(R_4)C_tH_{2t}-$, wherein E is H, CH_3, C_2H_5, Cl or OR^5 (R^5 is H, CH_3, C_2H_5, $COCH_3$, COC_2H_5, or CH_2COOH or salts thereof), s is an integer of 0 to 4, R^4 is an alkyl group having a carbon number of 1 to 4, and t is an integer of 1 to 4; and r is an integer of 2 or 3.

14. The material for molding according to claim 13, in which

the internal release agent (C) comprises

a single species selected from the group consisting of carboxyl-modified organopolysiloxanes (c1) and ether-modified organopolysiloxanes (c3),

a combination of at least one species selected from the group consisting of carboxyl-modified organopolysiloxanes (c1), epoxy-modified organopolysiloxanes (c2) and ether-modified organopolysiloxanes (c3), and fluorine-modified phosphates (salts) (f), or

a combination of carboxy-modified organopolysiloxanes (c1) and ether-modified organopolysiloxanes (c3).

15. The material for molding according to any one of claims 1 to 14, in which

the material further comprises an additive (D).

16. A slush molded article produced by heat molding a material for slush molding of any one of claims 1 to 15.

17. A slush molded skin for an automobile interior produced by heat molding a material for slush molding of any one of claims 1 to 15.

18. An automobile interior material comprising a slush molded skin of claim 17.

19. The material for slush molding according to any one of claims 1 to 15, in which

said resin (A) has the glass transition temperature of from -60°C to -35°C, and the material is a material for molding an instrument panel skin integratedly having air bag door sections formed in such a way that a tear line for tear opening does not appear on the design face.

20. An automobile instrument panel skin which is produced by molding a material for molding of claim 19 and which integratedly has air bag door sections formed in such a way that a tear line for tear opening does not appear on the design face.

21. A method for producing an automobile instrument panel skin integratedly having air bag door sections formed in such a way that a tear line for tear opening does not appear on the design face, comprising:

heat molding the material for molding of claim 19, and

forming a tear line for tear opening air bag door sections on the molded product obtained in said heat molding step so that

the tear line dose not appear on the design face.